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Middlesex Community College

Summary of Current Waste Management and Recycling Program And Recommendations for Increasing Diversion

Prepared for:

The Executive Office of Environmental Affairs

By:

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Project Basis:

The Massachusetts State Sustainability Program of the Executive Office of Environmental Affairs has funded this project. The first project goal is to examine solid waste and recycling efforts at college and university campuses throughout the State, with respect to meeting the recycling goals waste bans promulgated by MA DEP. Based upon that review, proposals are made for incremental improvement in waste management and recycling practices to increase diversion of materials and reduce disposal in a most cost-effective fashion.

For additional information on the State Sustainability program please contact:

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Middlesex Community College:

Middlesex Community College has two campuses in Bedford and Lowell, Massachusetts. The Bedford campus has a segregated Old Corrugated Containers (OCC) collection as well as a white paper collection program. Lowell has a mixed paper collection program. The Bedford white paper program is relatively expensive, so adjustments to existing contract should be sought to improve the costs and thus the long-term sustainability of the program. For example, additional paper grades may be included, resulting in mixed office paper. Also, the exclusive use of a container for relatively light OCC offers an opportunity to divert significantly more tons by shifting to general mixed paper. While some material revenue will be lost by not segregating out the white paper, the increased recycling rates caused by additional paper grades will compensate through avoided general waste management costs.

Summary of Key Recommendations:

Bedford:

1. Shift dedicated OCC container to collection of general mixed paper.

2. Reduce the collections of the two 10 cu. d. general waste containers from the scheduled 104 per year each to about 89 on an on-call basis, when containers are at least 75% full.
3. Reduce the collections of the one 10 cu. Yd. food service waste containers from the scheduled 260 per year each to about 216 on an on-call basis, when containers are at least 75% full.

Lowell:

Reduce mixed paper collections from the scheduled 26 times/year to about 15 times/year on an "on call" basis when containers are at least 80% full.

Summary of Predicted Program Benefits

1. By expanding to mixed paper collections at Bedford, recycling percentage increases over 300% from 7% to 22% of all material managed.
2. By decreasing the number of collections, there is a resulting one year savings of over $5,200 overall.
3. Average cost for managing a ton of recycled material drops from almost $107 to under $30.
4. Average cost for managing a ton of all materials combined is reduced from about $64.50 to about $55.

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Solid Waste Management Practices:

Waste Management and Recycling Vendors:

Bedford:

Northern Atlantic Waste Systems (MSW vendor)
Contact: (978) 535-6312

Contract Start date 07/01/2002
Contract End date 06/30/2003

Earthworm (White paper recycling vendor)
Contact: (617) 628-1844

Lowell:

Browning Ferris Industries, Inc (MSW and mixed paper vendor)
Contact: (978) 226-9400

Contract Start date 07/01/2002
Contract End date 06/30/2003

Equipment, Collection Schedule and Contract Costs:

Bedford:

MSW, general waste in two 10 cu. yd. containers collected 104 times each year.
MSW, food service waste in one 10 cu. Yd. container collected 260 times each year.

Lump sum annual cost $22,840 ($25,596 minus proportional share attributed to recycling collection)

Recycling, OCC in one 10 cu. Yd. container collected 52 times each year.

Lump sum, $2,756/year (proportional share of campus wide lump sum contract of $25,596)

White paper in eight 96 gallon toters, each collected 4 times each year.

$3.50/pick-up each toter, $112/year

Lowell:

MSW, One 30 cu. yd. compactor, collected nine times a year
Est. $150/compactor/month- rental, =$1,800/year
Est. $100/pickup/compactor, =$900/year
Est. $75/ton tip fee
Est. Total disposal: $8,775/year

1. **Recycling**, mixed paper in one 10 cu. d. container collected 26 times each year.

   Est. $50/pick-up, $1,300/year

In Bedford 95 gallon toters for the collection of white paper are placed in academic building locations where significant amounts of paper are generated and to maximize convenience to office workers (near copy machines, printers, near clusters of offices, library, etc.) Office workers are given blue desk side containers that they are responsible for emptying when full in the centralized 95 gal toters. This system, versus a system where a maintainer collects paper deskside from each office, has the advantage of placing fewer burdens on the maintainers, but may hinder some of the less enthusiastic individuals from participating at all. The maintainers use a small rack truck to deliver full 95 gal toters to one central pickup location at the Campus Center loading dock..

In Lowell, the estimated recycling results in mixed paper indicate a significant under-usage of the 10 yd dumpster because of regularly and too frequent scheduled collections. An on-call collection approach would reduce the number of collections required and reduce the cost of collecting recyclable mixed paper.

Unless otherwise noted, all statistical evaluations are based on the aggregate numbers from both campuses.

Key Issues to be Addressed:

- Existing paper collection programs on both campuses can be improved.
- At Lowell, it is estimated that containers are under-filled at collection, based on statistics available. So improved efficiency and lower cost is the expected results of implementing recommendations.
- At Bedford, it is estimated that very low recycling diversion is being achieved because of the low weight of segregated OCC.

Costs of Solid Waste Collection

With respect to solid waste, MCC disposes over 500 tons. The total cost for solid waste collection and disposal is $35,783, resulting in a per ton cost of about $62 for collection and disposal of solid waste.

Estimates of recycling rates:

Using the available annual waste and recycling tonnage data, the base case estimate shows Middlesex Community College recycling about 39 tons of paper annually, representing a recycling rate of 7%. Based on recent research, paper represent about 31%[1] of the pre-recycling educational institution waste stream. So, based on estimates in the absence of unit-based recycling data, MCC is recycling less than 25% of the available paper.

Standing alone, the Lowell campus is recovering nearly 21% of all materials collected as mixed paper, still able to seek about 5% more. Bedford, on the other hand, is capturing only about 4% of its waste stream as white paper and OCC. Bedford's total generation of all materials, however, is about 4.5 times that of the Lowell campus.

So, the first step necessary for MCC to improve their existing program is establishing waste management and recycling services agreements that offer both unit based pricing and clear reporting of material generation and management data for all managed materials. In addition, an on-call collection basis, rather than scheduled, may allow some

[1] ***Advancing Resource Management at Fitchburg State College*** (Fitchburg, MA), Tellus Institute for Mass. DEP, January 2002; cites: By weight (before recycling), based on waste stream profiling performed by Harvard University in 2000 and supported by California Integrated Waste Management Board Waste Composition study http://www.ciwmb.ca.gov/WasteChar/BizGrpCp.asp - educational institution data.

reduction in collections necessary or the use of smaller containers. This should result in a reduction in fees.

Cost of Existing Recycling Program

The total current cost for the recycling program is estimated at $4,168, resulting in an average recycling cost of almost $107/ton.

Contract Evaluation

Contract Terms

At the Bedford campus, all waste management and recycling activities have been contracted for a lump sum. This is the least helpful form of contract with respect to tracking incremental changes in the program, as there are no unit costs provided for any aspect of the system.

Contract terms have not been provided for the Lowell portion of the school's waste management program, so typical commercial rates have been estimated for the types and collection schedule of containers at that campus. Should those terms become available, these estimates can be refined.

General Suggestions for Contract Improvement:

Atlantic Waste has recommended that more paper should be recycled for environmental and financial reasons. The proposed changes in paper recycling, represented in the hypothetical case attached, bear out this recommendation. While the estimated generation, disposal and cost of management per estimated ton numbers are nominal at MCC, lump sum pricing with no firm weight records for any materials is a weak point. Whatever the program diverts today, there should continue to be an interest in finding improvements. Having unit prices for disposal and container services, as well as accurate quantity/weight records for material flow are an important tool in accomplishing that.

It is important to institute unit measurement and some review of remaining capacity that may be in some containers collected on a schedule, rather than on an "on-call" basis.

The first step necessary for MCC to improve their existing program is establishing waste management and recycling services agreements that offer both unit based pricing and clear reporting of material generation and management data. In addition, an on-call collection basis, rather than scheduled, may allow some reduction in collections necessary or the use of smaller containers. This should result in a reduction in fees.

Existing Mechanism that Allow for Recommended Changes

There are 35 solid waste services vendors, qualified as contractors under Mass OSD's statewide contract (ST1J391) for waste removal and recycling services that explicitly make it possible to switch to "on-call" services. Browning Ferris Industries (the vendor at MCC's Lowell campus) is a qualified vendor included on this list. Contract ST1J391 requirement #11 requires that: *All contractors must agree to* ***reduce collection*** *frequency at department facilities at any time during the agreement period should a facility request such a reduction as a result of greater recycling and/or waste prevention activities. Such reductions in collections should result in associated reductions in price.* It is possible that an on-call collection system would be more cost-effective.

Detailed Suggestion:

Even if a lump-sump sum fee arrangement should continue, if the school receives accurate reports on quantities managed, a reasonable calculation of per ton costs can be established and tracked through potential future changes. Once again, OSD's contract, ST1J391 would provide a solution. Requirement #10 requires that: *Contractors must submit* ***semi-annual statewide reports*** *to the PMT and must submit individual facility reports upon request which details the quantity of materials disposed of and/or recycled during the previous 6 months*. Since the contracts language does not specify that "weight" be provided, volumes may be the only measure of quantity available. However, if the "on-call" collection approach were adopted and containers were a known percentage full when hauled, reasonable weight estimates can be made from industry volume to weight conversions. If weight slips could actually be negotiated with the vendor, that would be the ideal circumstance. MCC could ask its current vendor at the Bedford campus if it would be willing to meet the same contract requirements as vendors on the statewide contract.

Recommendations to upgrade current recycling:

MSW:

1. At Bedford, reduce general waste collections at the two 10 cu. d. containers dedicated to general waste from 104/year each to 89/year each, on an "on-call" basis when the containers are at least 75% full.
2. At Bedford, reduce waste collections at 10 cu. yd container at Food Services from 260/year each to 216/year each, on an "on-call" basis when the containers are at least 75% full.
3. At Lowell, one less compactor collection (eight instead of nine) should be possible due to increased paper diversion.
4. Amend agreements to provide accurate reporting of material amounts managed, in addition to unit prices for container services. This will allow a more accurate

tracking of materials managed and the unit price per ton for each material managed.

5. Carefully review how full all containers are before they are collected to see if a reduced schedule and/or an "on-call" collection approach can be adopted. For a two month trial period, establish a visual tracking system to determine the percent full of containers when collected to better understand the real cost of disposal.

Recycling

1. At Bedford, switch to mixed paper collection in place of the current segregated white paper and OCC only collection. MCC should continue to use the current system of centralized 95-gallon toters for the collection of mixed paper. This system is working efficiently now and best to parallel the current system than change operations causing disruptions for both participants and maintainers. While collections from deskside bins would certainly yield more volume of materials, it is felt that the maintenance staff are at capacity and cannot handle an additional workload. It is likely that additional toters would be required to handle increased volume of material. It is recommended to monitor carefully capacity of containers when collected and add toters as needed. These full toters can be emptied from the lift gate of the truck used to deliver the full toters to the 10 yard dumpster previous dedicated to OCC alone. It is hoped that if the expanded mixed paper toter effort begins to show the cut into solid waste costs that are possible, the Administration would see that involving maintainers more intensely by doing desk side collection of mixed paper along with trash would be worth the effort.
2. At Bedford, implement additional outreach to change over to a mixed paper program. This is especially important in a situation where a little extra effort is required on the part of the participants (emptying their own deskside recycling bins.) Thus they will need a little extra encouragement. This will require an intensive effort through existing communications channels to announce the program change. Emailing campaigns, ads and articles in campus bulletins, newspapers, newsletters are some examples of opportunities for outreach. If possible to recruit a work-study student to work on the outreach effort and make announcements in meetings and classes as well as conduction a monitoring campaign this would be ideal.
3. At Lowell, reduce collections at mixed paper collection container from an estimated 26/year to an estimated 15/year each, on an "on-call" basis when the containers are at least 80% full.
4. Amend agreements to provide accurate reporting of material amounts managed, in addition to unit prices for container services. This will allow a more accurate tracking of materials managed and the unit price per ton for each material managed.
5. Carefully review how full all containers are before they are collected to see if a reduced schedule and/or an "on-call" collection approach can be adopted.

For a two month trial period, establish a visual tracking system to determine the percent full of containers when collected to better understand the real cost of disposal.

6. Increase paper diversion by providing paper collection bins scaled to desk side use in all administrative areas and in other locales of high diversion (near printers, copiers, clusters of offices). Office workers will still be responsible for emptying their own recyclable material into the toters, but these blue containers next to every desk will serve as a reminder to recycle.
7.

Spreadsheet Tracking Model

The consultants have developed spreadsheet tracking models to assist the school's planning staff in attaining the optimal cost scenario for their existing or planned recycling and solid waste management programs. This tool should prove enormously helpful in assisting schools to make the necessary adjustments in targeted materials, containers, vendors, etc., to achieve the highest possible diversion at the lowest possible cost.

The models work as follows:

The tracking model is an Excel workbook, consisting of three primary worksheets, followed by a series of additional worksheets that could be employed to address additional expense or revenue items like amortizing purchased equipment or generating an equipment replacement fund. Any additional expense or revenue issues could be added to this model in the future as required.

The first worksheet includes basic data about the existing program and circumstances, such as the rate of inflation, the densities of different materials and the current revenue per ton for recyclable materials. These assumptions can be changed, if necessary, due to changing circumstances over time. In addition, on the first worksheet, there is an extensive input matrix, with each data input item highlighted in yellow.

This matrix provides spaces to profile current or future container and collection schedules for waste and for recyclables. For each container type, there are input spaces for: # of containers, the size, collection schedule and known fees for collection, container leases or disposal, percent full when collected.

For the first year, we have attempted to capture, as accurately as the available data allows, what the current circumstances are for all containers for all materials. This column represents the "base case." The power of the model lies in its capacity to allow "what-if" estimates for future years, by varying any of the input variables highlighted in yellow.

Using the data and assumptions described above, the first worksheet calculates the following:

Total waste collection cost
Total waste disposal cost
Total tons of waste disposed
Total recycling cost
Tons of mixed paper recycled
Tons of OCC recycled
Tons of commingled containers recycled
Total waste and recyclable material generation in tons
Recycling percentage
Annual mixed paper revenue
Annual OCC revenue
Annual commingled revenue

The second worksheet of the model is a Budget Summary pro-forma, which takes data from the assumptions and data sheet and breaks out the financial implications of the base case, as well as any what-if scenarios. In addition to restating the total expenses for waste collection and disposal as well as recycling programs, this worksheet breaks out the cost/ton to manage waste, cost/ton to manage recyclable materials and combined cost/ton for all materials. If revenues are relevant, the revenue stream is also captured. Finally, the annual total for all waste and recycling activities is calculated, as is a three-year total.

Therefore, as container sizes, collection schedules or fees are changed, the impact on total recycling percentage, cost, cost/ton for waste and recyclables management can be easily seen. This allows the opportunity to establish hypothetical cases and compare the costs and volumes managed to the current base case. As years pass, the model continues to sharpen each current case, while providing more accurate predictions for possible future cases. When each year has passed, comparing actual results to what had been predicted a year or more earlier allows one to easily assess the degree to which performance expectations have been met or where changes may still be needed. In any event, each campus will have a clear and accurate picture of volumes of materials being diverted and disposed, as well as all costs related to those activities.

Finally, the third worksheet is the summary of the current recycling and waste management contract terms at the school.

Environmental and Cost Benefits of Implementing Recommendations:

1. Increased OCC and mixed paper diversion is likely to reduce the MSW heading to the landfill or incinerator. This has both a financial and environmental benefit in resource savings (trees, energy, water).
2. There is a savings in landfill capacity, which is at a real premium especially here in Massachusetts. Much MSW is shipped out of state, which has a huge cost both

financially and environmentally. By diverting material from the incinerator, results in a net reduction in potentially harmful air emissions

3. The proposed changes result in an estimated increase in recycling rate of over 300 %, rising from 7% to 22% of all material managed.
4. The proposed changes result in an estimated decrease in disposal of over 84 tons, from 516 to 432 tons.
5. The proposed changes result in an estimated net savings of about $5,200.
6. Base Case - Data interpretation: (***Please refer to Attachment A – Worksheets One & Two***). The current situation or "base case" is reflected in the first column, throughout the model. This column includes all actual annual data available. The total cost of all material management is estimated as $35,783, found on the second worksheet at the bottom of the budget pro-forma. Also found on this worksheet, are the following average "base case" costs: $61.29/ton of MSW managed; $106.90/ton of recyclable materials managed; and $64.49/ton for all materials managed.
7. Year One of proposed changes - Data interpretation: (***Please refer to Attachment A – Worksheets One & Two***). The first year of proposed changes is reflected in the second column, throughout the model. This column includes: a) the reduction of collections of Lowell's 10 cu. Yd. paper collection container from 26/year to 15/year, on an "on-call" basis when the container is at least 80% full; b) shift at Bedford from a dedicated 10 cu. Yd. container for OCC to mixed paper collection; c) at Bedford, the reduction of the collections of two 10 cu. Yd. general waste containers from a scheduled 104/year each to about 89/year, on an on-call basis when the containers are at least 75% full; d) at Bedford, the reduction of collections of one 10 cu. Yd. food service waste containers from a scheduled 260/year to about 216/year, on an on-call basis when the containers are at least 75% full and e) at Lowell, the reduction of collections at the 30 cu. yd. compactor from 9/year to 8/year.

   The total cost of all material management is estimated as $30,574, a reduction from the base case of $5,209. Also found on this worksheet, are the following average "Year one" costs: $62.40/ton of MSW managed; $29.55/ton of recyclable materials managed (a steep reduction of $77.35 per recycled ton); and $55.14/ton for all materials managed.

Conclusions:

- Largest immediate benefit would derive from an improved MSW management contract and disposal oversight, which may be achieved by requesting the favorable terms of the Mass OSD statewide waste management contract (ST1J391) from their current vendor.
- In the current contract environment, the financial incentive is clear to divert more paper and reduce fees devoted to waste collection and disposal.
- There would be a need for outreach and adjustments to in-building collection activities to support paper diversion success.

- The additional savings could be used to support educational outreach and distributed smaller containers or, in time, pilot comingled projects to help meet waste ban requirements.
- An on-call collection system, hauling only very full containers, may add additional savings that might be used to offset additional incremental expense of paper collection infrastructure.